

ONTARIO MINISTRY OF ENVIRONMENT



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The Great Lakes YESTERDAY TODAY & TOMORROW

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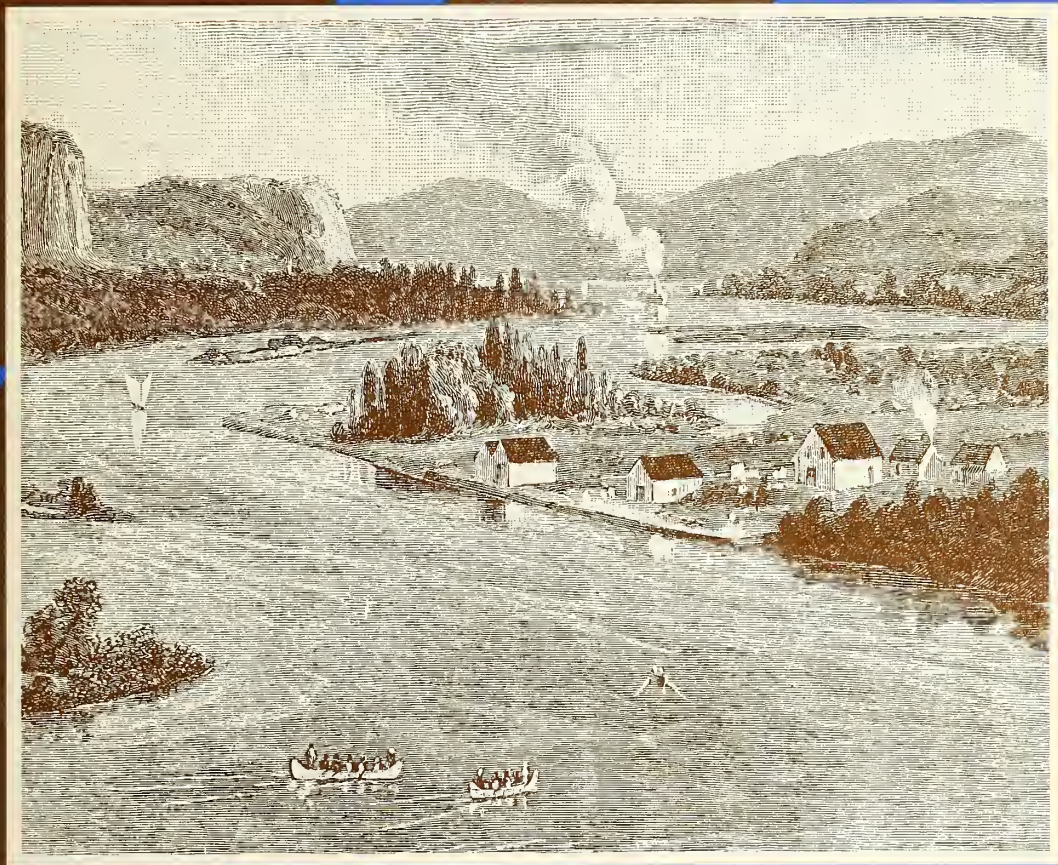


**Ministry
of the
Environment**

April 1982 marks Environment Ontario's 10th Anniversary. *The Great Lakes: Yesterday, Today and Tomorrow*, available in both English and French, is one of several publications being produced this year in conjunction with the Ministry's anniversary celebrations.

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The Great Lakes : yesterday,
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The Great Lakes YESTERDAY TODAY & TOMORROW

Our Commitment to the Future



The Canada-Ontario Great Lakes Water Quality Agreement, signed by representatives of the Federal and Provincial Governments, formalizes their commitment to preserve and maintain the quality of our boundary waters. Both Governments have reaffirmed their willingness to co-operate in developing, co-ordinating, and implementing future study and abatement programs for the Great Lakes.

As a milestone in Ontario's quest to safeguard the environmental integrity of our lakes and rivers, the Agreement complements existing programs by placing a greater emphasis on the control of toxic substances and pollution from diffuse sources, such as urban and agricultural runoff. The Agreement also renews the Province's previous obligations to the control of pollution from: 1) municipal discharges (phosphorus), dredging, pest control products, shipping, and animal wastes; 2) liquid and solid industrial wastes, thermal wastes, and radioactive wastes. The Agreement also stresses the maintenance of a joint contingency plan to deal with large spills of oil and other hazardous substances.

Ontario's commitment to the Great Lakes began shortly after the signing of the 1909 Boundary Waters Treaty, with the Ontario Department of Health undertaking extensive investigations of the Province's potable water supplies. Since that time, pollution abatement and prevention programs, guided by continuing investigation and surveillance, have attacked major sources of Great Lakes pollution. These programs are being constantly refined and modified to identify and remedy problem areas and to protect areas of high water quality.

Ontario's commitment to the protection of the Great Lakes has been made and this commitment will be extended to uphold any future standards which may be required by the Canada-Ontario Great Lakes Water Quality Agreement. Evidence indicates a gradual recovery occurring in the environmental state of the Lakes, and further restoration of water uses affected by the deterioration in water quality, preceding the 1972 Agreement, is possible through continued provincial, federal, and international co-operation and the support of concerned individuals.



Ministry
of the
Environment

Hon. Keith C. Norton, O.C.,
Minister

G rard J. M. Raymond
Deputy Minister





Yesterday...



Since the beginning of European settlement, life in Canada has focussed on the Great Lakes. First travelled by such explorers as Samuel de Champlain and Etienne Brûlé in the early 17th century, the Land of the Great Lakes epitomized the abundance of natural wealth and splendor that was to be found in the New World. It wasn't long until tales of this New World began trickling back to an eagerly awaiting audience in Europe.

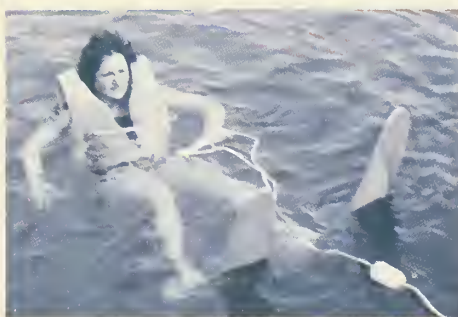
By the middle of the 17th century, the exploitation of Canada's natural wealth was drawing venturesome men of many European nations to its shores.

Tales had been heard of astonishing riches, furs, trade, investment, land for the settling, and wealth. Empire builders, missionaries, explorers, traders and fortune seekers clambered aboard ships destined for the New World, each with his own bright vision of what this strange new land would hold in store for him.

Despite the hardships of wilderness, bitterly cold winters, wars, hunger, and disease, the human population continued to increase and within 200 years a vast new empire had been settled. The Land of the Great Lakes was destined to become the industrial hub of the nation.



Today...



Today, the Great Lakes play a crucial role in the social and economic well-being of Canada. Nearly six million Canadians live in the Great Lakes basin, a population greater than any of Canada's provinces, except Ontario and Quebec. Including the population of the American portion of the basin, nearly 33 million people depend on this great inland waterway as a major source of employment and recreation.

Virtually every type of industry has made its home on or around the Great Lakes' 12,800 kilometers of shoreline, accounting for 50 per cent of Canada's gross national product.

In Ontario, a region rich in natural and industrial resources and bordering on four of the five Great Lakes, residents depend on the Great Lakes as a major international and domestic transportation artery. The harbours handle ore and coal for the primary iron and steel mills, coal for electrical power generation, wheat for export overseas and also provide shipping ports for lumber, steel, petroleum, agricultural and fish products, and other Canadian goods. In 1980, exports accounted for \$29.2 billion.

Second only to manufacturing in terms of revenue and employment, is Ontario's tourist industry. In 1980, 26.8 million tourists from the United States were drawn into the Province, seeking out the beauty, the lake-water wilderness, the fishing, swimming, and boating, and the many other attractions offered in Ontario's vacationland.

The Great Lakes also support a commercial fishery. Valued at \$24 million per annum, Ontario's commercial fishing industry employs approximately 2,000 people and annual catches average 59 million pounds.

As a natural resource, the five Great Lakes — Superior, Huron, Michigan, Erie, and Ontario — are truly a unique feature of the North American environment. Stretching over a length of 3,840 kilometers, nearly halfway across the continent, they collectively form the greatest fresh-water system on earth.

Draining an area of approximately 1,762,000 square kilometers, the Great Lakes contain 80 per cent of the fresh water in storage in North America's lakes, or approximately 5,500 trillion gallons of water.

At home, the average Canadian uses about 230 litres of water each day, while industrial, agricultural, utility cooling, and domestic use totals nearly 6,400 litres per person each day.

In 1980, Canadians used 26.3 billion gallons of water each day. Research indicates that this figure will double over the next 20 years.

Until recently, most Canadians living in the basin thought of the Great Lakes as a seemingly endless water supply. But each day, pollution — from industrial and urban runoff, and a wide range of urban contaminants — affects this vital fresh-water supply and requires controls to protect the well-being of millions of Canadians who depend on a healthy Great Lakes.

Fortunately, our dependence on the Great Lakes has led to an early recognition of the problems resulting from over 150 years of exploitation and abuse. Corrective actions have accelerated from about 1950 on to maintain and improve the water quality of the Great Lakes and to ensure that Canadians will continue to reap the recreational, economic, and esthetic benefits of the Great Lakes for generations to come.



The State of the Great Lakes



Over the last 150 years, increasing use of the Great Lakes has brought with it increasing problems. Fortunately, the potential and real damage caused was recognized and acknowledged by both scientists and governments alike. Efforts have been made to pinpoint the problems, assess their significance, and initiate corrective action.

Although significant improvements in the quality of the Great Lakes ecosystem have been recorded and factors affecting the quality of inland waters identified and their impact greatly reduced, the fact remains that many problems still exist.

In the past, little concern was paid to the environmental degradation caused by lakefill sites and the filling in of natural shorelines and wetlands. Minute organisms and small plants at the bottom of the food chain were buried. Water current patterns were disrupted and spawning grounds and habitat destroyed.

Extensive dredging carried out on the Great Lakes to maintain proper depth of navigation channels, and to excavate new channels and harbours, has also proven to be of environmental consequence. Dredged materials may be contaminated, previously buried substances may recontaminate the water, and improper disposal sites may allow leachates to seep back into the water, affecting water quality and threatening the delicate ecosystem.

Urban and industrial development has led to increased, essentially year-round shipping activity with thousands of barges, boats, and freighters plying the Great Lakes each year. Each vessel has the potential capability of damaging our natural resources, of contaminating inland waterways by discharging human and vessel waste, and of spilling cargos that are hazardous or toxic to aquatic life.

Development has also led to increased municipal waste disposal. Many synthetic organic chemicals such as phenols and PCB are discharged in very low concentrations with effluent into lake waters along with such materials as lead, mercury, chlorine, and ammonia. Some of these chemicals bioaccumulate in the tissues of fish, aquatic plants, and wildlife. In concentrated amounts, they can interfere with breeding cycles, cause deformities or death, and eventually contaminate the food chain. Bioaccumulative substances break down very slowly and can be passed on to predators and eventually affect man.

Another problem of environmental consequence is phosphorus, a natural substance often used as fertilizer or added to industrial and domestic cleaning agents. As a primary nutrient, phosphorus is necessary in small quantities to sustain aquatic micro-organisms, the base of the food chain. However, in large quantities (as can be found in treated and untreated sewage, industrial wastes, urban stormwater and agricultural drainage), phosphorus can promote and maintain excessive aquatic plant and algae growth. In time, this may lead to "algal blooms" or the streams, rivers, and lakes literally being choked with aquatic plants. The results can be harmful to fish and impair the use of the water for human consumption and recreational activities.

Urban and agricultural runoff of pesticides, fertilizers, bacteria, chlorides, nitrates, sodium, and phosphorus have also been cause for concern. Washed from the surface of the land by sheet erosion or heavy downpours, these materials enter the lakes usually without any form of treatment. By creating new water quality problems or compounding existing ones, these persistent pollutants can affect aquatic life or impair water quality to the point where it interferes with some human uses.



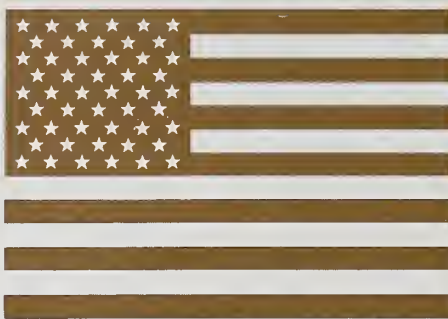
In addition, pulp and paper activities on the shores of the Great Lakes, such as log storage and sorting, have also had damaging effects. Leachates from mill ponds, common in the bays of Lake Michigan and Lake Superior, may be toxic or hazardous to aquatic life. Bark decomposition on the lake bottom causes oxygen depletion and mill discharges of suspended solids and colors detract from the esthetic quality of the water, affecting its clarity and appearance.

Even the hauling and disposal of these liquid industrial wastes may prove to cause serious environmental damage. Hazardous or toxic materials may leach into the lakes as a result of improper hauling, accidental spills, or inadequate disposal sites.

Another ever-increasing concern is airborne contaminants. Carried by air currents, they contaminate the Great Lakes from sources hundreds or thousands of miles away. It has been estimated that 19 per cent of the phosphorus and 40 per cent of the heavy metals found in Lake Superior came from the atmosphere. Both have serious effects on the Lakes' delicate ecosystem and can eventually affect man.

Fortunately, none of these problems have gone unrecognized. Each day we learn more about the Great Lakes, their many components, and their protection. Although much has been done to alleviate the problems, there is still much that has yet to be done. Recent accomplishments suggest that significant corrective actions are being taken, and that progress is being made.

Canada and the United States: International Co-operation



Both Canada and the United States share one of the world's greatest natural resources — the Great Lakes. Ontario, Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York all lie along their 1,200 miles of international border. Dependence on the Great Lakes and recognition of the crucial role they play has led to co-operation on the part of both the Canadian and American governments to improve and maintain the quality of our boundary waters.

The 1909 Boundary Waters Treaty was signed between Canada and the United States. As stated in Article 4, the Treaty provided that "boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other." The Treaty created the International Joint Commission to prevent disputes over the use of boundary waters and to deal with boundary problems between the two countries.

Between 1912 and 1969, the IJC conducted several studies on Great Lakes' pollution, at the request of both governments. One study resulted in an in-depth report on the water quality of Lake Erie, Lake Ontario and the St. Lawrence River. The report recommended two studies be conducted to determine the water quality of Lakes Superior and Huron and to investigate pollution from a wide range of land-use activities. The second recommendation, an international lower-lakes clean-up effort, resulted in the signing of the Great Lakes Water Quality Agreement in 1972.

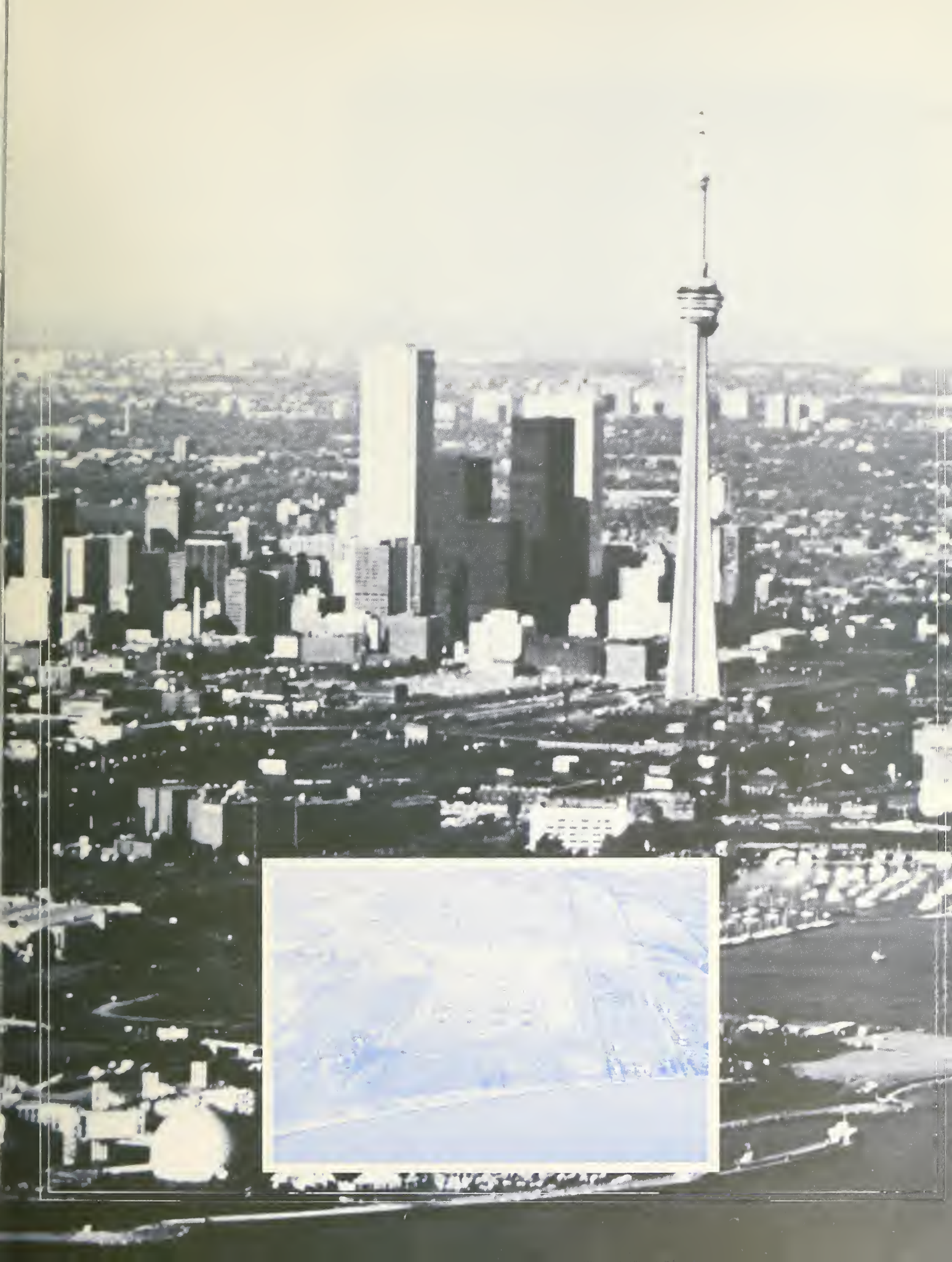
The Agreement co-ordinated an international clean-up effort. Water quality objectives were defined and billions of dollars were spent developing and implementing programs to enhance the water quality of the Great Lakes.

Responsible for overseeing the implementation of the Agreement, the International Joint Commission became actively involved in analyzing and disseminating information. The Commission advised both governments on effectiveness of programs and provided water quality updates. To aid the IJC in this function, two new institutions were created: The Great Lakes Water Quality Board, to advise the Commission on water quality and to recommend specific remedial and management action; and the Great Lakes Research Advisory Board, to advise the Commission on the co-ordination of water quality research.

In 1978, the Canadian and U.S. governments reviewed the Agreement of 1972 and decided to revise it. Significant problems such as toxic substances found in fish and wildlife, urban and agricultural runoff, and airborne contaminants had been documented and now needed to be addressed.

Even more comprehensive than the original agreement, the 1978 Great Lakes Water Quality Agreement went beyond the Great Lakes and the commitment to collect data and monitor water quality effectively. A greater emphasis was placed on toxic substance management, dredging and shipping regulations, and continuation of the phosphorus control program started in 1972.

Although parties to the Agreement are the two Federal governments, responsibility for enforcement and co-ordination of activities falls on State and Provincial jurisdictions. Co-operation has extended to Ohio, New York, Pennsylvania, Indiana, Illinois, Michigan, Wisconsin, Minnesota and Ontario. Ontario, because of its environmental mandate under the Canadian constitution, takes a strong role in management and pollution control. All international participants actively involve themselves in implementing water quality programs and commit themselves to improve, maintain, and ensure the quality of our boundary waters for generations to come.





Ontario Ministry of the Environment: The Great Lakes Program

For almost a century, Ontario has been investigating water quality of the Great Lakes and studying the inter-relationship between environmental degradation and interconnecting waterways. Evidence of involvement in Great Lakes surveillance programs is contained in reports on investigations of potable water supplies made just after the signing of the 1909 Boundary Waters Treaty.

Through surveillance of water quality in the nearshore waters of the Great Lakes and in interconnecting waterways, Ontario has been able to provide information on:

- Water use suitability
- Pollution sources and their effects
- Development of remedial and preventive waste management programs
- Assessment of the effectiveness of abatement programs

Participation in the Great Lakes Surveillance Program began in 1966 when the Ontario Water Resources Commission joined with the Canadian and U.S. governments and the Great Lakes States to conduct a detailed investigation of pollution problems in Lake Ontario, Lake Erie, and the St. Lawrence River. Recommendations made by the study, revealing significant pollution problems in the Great Lakes, led to an attempt to remedy the situation and to the signing of the Great Lakes Water Quality Agree-

ment in 1972. At the same time, the Ontario Water Resources Commission and its associated agencies were incorporated into the Ontario Ministry of the Environment (Environment Ontario).

Since 1972, the federal-provincial cost-shared surveillance and assessment program has provided.

- Data for determining effective pollution abatement measures necessary to restore and maintain water quality in accordance with the provincial objectives and the objectives of the Great Lakes Water Quality Agreement.
- Information relevant to the assessment of the effectiveness of remedial measures undertaken at industrial and municipal pollution sources.

In 1981, Canada and Ontario spent \$4.9 million diagnosing the condition of the Great Lakes. Continual monitoring and testing of the quality and levels of water throughout the basin has documented the continuing trend towards greater stability in water quality throughout the Great Lakes. Marked improvements have resulted from international efforts made over the last decade in the abatement of major pollution sources.

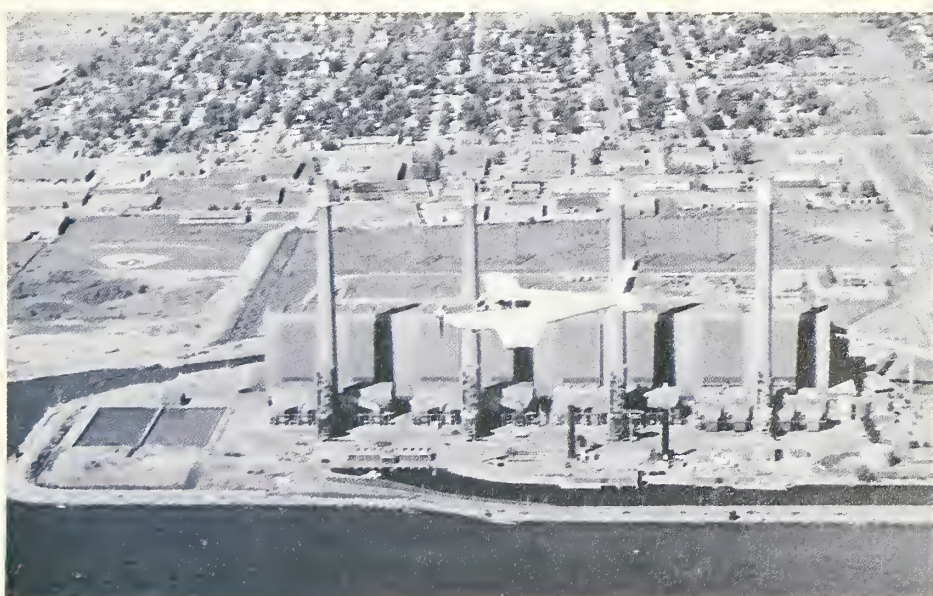
In the late 1960s, Ontario initiated an extensive phosphorus-control program, installing phosphorus removal equipment in all major sewage treatment plants in the Canadian portion of the Lower Great Lakes basin. Today, with Ontario's expenditures on sewage treatment facilities totaling nearly \$1.2 billion, nutrient enrichment and nuisance algal growth has been greatly diminished. Recreational opportunities, fishery habitats, and efficiency in water treatment for domestic supply in the Great Lakes basin have also improved, and incidence of taste and odour problems in water supplies reduced.

A steadily increasing knowledge of distribution of compounds such as PCB, DDT, mercury and other previously unidentified compounds has also resulted from the Great Lakes surveillance program. Early recognition has led to isolation of the sources and implementation of controls on the manufacture, use, and emission of contaminants of immediate concern.

Sampling of fish for trace contaminants in the Great Lakes began in the 1970s. Data now indicates sizeable reductions of PCB and DDT in forage fish, confirming a gradual recovery of the Lakes' ecosystems and pointing towards a continual decline of these contaminants in adult sportfish as well.

At a local level, abatement programs are showing marked success. To date, results indicate:

- Substantial decreases in organochlorine concentrations in Great Lakes fish
- PCB concentrations declined between 22 and 89 per cent in Lake Ontario forage fish samples
- PCB concentrations declined between 60 and 89 per cent in Lake Erie forage fish samples
- Similar PCB trends are evident in Lake Huron and Lake Michigan forage fish samples
- Phosphorus loading to the Great Lakes has been significantly reduced
- Phosphorus loads to Lake Erie from the Detroit River have been reduced by more than 80 per cent since 1968
- Diminished nutrient levels and algal growth are evident in Lake Erie and Lake Ontario
- Reduced nutrient and bacteria levels have been recorded along the Toronto Waterfront
- Reduced incidence of taste and odour in Belleville's domestic water supply as the result of a special project
- Reductions in the Great Lakes mercury, phenolic, and bacteria levels
- Lake Erie's commercial fishing ban was removed in 1976 as a result of decreased mercury levels
- Similar mercury trends in Lake St. Clair
- Reduced phenolic and bacteria levels in St. Mary's River at Sault Ste. Marie
- Reduced bacteria levels in the Detroit River
- Reduced heavy metal contamination in Lake Erie and along the Detroit River





In addition to abatement measures, Environment Ontario has also undertaken countless studies and testing programs. One recent study, the St. Clair River Organics Study, determined the mutagenic properties of organic compounds in various industrial and municipal effluents discharged in the St. Clair River and investigated remedial action. Results are enabling the Ministry to develop programs with industry in Sarnia to reduce further loading of organic chemicals to the St. Clair River.

The application of predictive water modelling is being used to determine and to establish the appropriate mixing zones for new or expanded waste-water



discharges, and to establish the relationship between waste inputs and their impact on water quality. This information has played a vital role in determining optimum outfall location, outfall design, and effluent requirements for municipal and industrial treatment facilities at Sault Ste. Marie, Sarnia and Cornwall.

In addition to its many water-quality monitoring activities, the Ministry is also actively involved in the Fish Contaminant Program in conjunction with the Ministries of Natural Resources and Labour. After analyzing fish samples taken from hundreds of lakes and rivers and stations of the Great Lakes, a publication is produced indicating existing



levels of contaminants such as mercury and DDT, and recommending levels of consumption for the various fish sampled. *The Guide to Eating Ontario Sportfish*, 1982, contains information on more than 70,000 fish taken from 1,100 waterbodies in Ontario.

The Ministry of the Environment is conducting studies to develop management schemes for controlling pollution from storm sewers and combined sewer overflows. Sources of airborne contaminants are also being studied, as well as thermal plumes and their effects on the Great Lakes.

With the signing of the 1982 Canada-Ontario Great Lakes Water Quality Agreement, Ontario is further committed to focus on a number of major areas of immediate concern to the Province, including: industrial waste control, control of persistent toxic substances and hazardous polluting substances, commencing a co-ordinated attack on control of pollution from diffuse land-drainage sources, and maintenance of contingency plans for control of oil and hazardous polluting substances.

Environment Ontario is continually providing environmental programs and services for the benefit of all who profit by the natural wealth of the Great Lakes. In addition, remedial actions are proving successful and gradual recovery in the water quality of the Lakes is evident.

Although the future will pose new environmental problems, they will not go unchallenged. The Ontario Ministry of the Environment will continue to protect and preserve Ontario's vital water resources.





Tomorrow...

Since the signing of the 1909 Boundary Waters Treaty much of the needless deterioration of the Great Lakes has been arrested and reversed. On both an international and a provincial scale, problems have been defined, solutions developed, and proper abatement measures incorporated.

Showing definite signs of improvement, the Great Lakes have come a long way, but long-term abuse threatens to mark this great inland waterway for generations to come. Agencies, such as Environment Ontario, have committed themselves to finding the best solution, the long-term solution. Extensive study, research, and abatement programs are directed at this ultimate goal.

In the past, the Great Lakes have served us well. Today, they play a crucial role in the social and economic well-being of Canada and are an essential element of Ontario's prosperity and natural wealth. Tomorrow, the challenges presented must be met by government, industry, and concerned citizens alike.

Detailed information regarding any of Environment Ontario's Great Lakes programs can be obtained by calling or writing:

Ontario Ministry of the Environment,
Communications Branch,
135 St. Clair Avenue West,
6th Floor,
Toronto, Ontario,
M4V 1P5.
(416) 965-7117

Great Lakes Section,
Water Resources Branch,
4th Floor,
1 St. Clair Ave. West
Toronto
(416) 965-6957

Information on Environment Ontario's programs and services is available from the following regional or district offices:

Northwestern Region

Thunder Bay Regional Office,
P.O. Box 5000,
435 James St. South,
Thunder Bay, P7C 5G6
Tel.: 807/475-1205

Kenora District Office,
P.O. Box 5750,
808 Robertson St.,
Kenora, P9N 1X9
Tel.: 807/468-5578

Northeastern Region

Sudbury Regional Office,
199 Larch St.,
Sudbury, P3E 5P9
Tel.: 705/675-4501

Timmins District Office,
83 Algonquin Blvd. West,
Timmins, P4N 2R4
Tel.: 705/264-9474

Sault Ste. Marie District Office,
445 Albert St. East,
Sault Ste. Marie, P6A 2J9
Tel.: 705/949-4640

North Bay District Office,
1500 Fisher St., Northgate Plaza,
North Bay, P1B 2H3
Tel.: 705/476-1001

Parry Sound District Office,
74 Church St.,
Parry Sound, P2A 1Z1
Tel.: 705/746-2139



Central Region

Central Regional Office,
Suite 700,
150 Ferrand Dr., Don Mills, M3C 3C3
Tel.: 416/424-3000

Barrie District Office,
12 Fairview Rd.,
Barrie, L4N 4P3
Tel.: 705/726-1730

Muskoka-Haliburton
District Office,
Gravenhurst, PoC 1G0
Tel.: 705/687-3408

Peterborough District,
139 George St. North,
Peterborough, K9J 3G6
Tel.: 705/743-2972

Halton-Peel District Office,
1226 White Oaks Blvd.,
Oakville, L6H 2B9
Tel.: 416/844-5747

Huntsville Sub-Office,
100 Main St. East, Huntsville, PoA 1K0
Tel.: 705/798-2386

Southwestern Region

London Regional Office,
985 Adelaide St. South,
London, N6E 1V3
Tel.: 509/681-3600

Windsor District Office,
250 Windsor Ave.,
6th Floor,
Windsor, N9A 6V9
Tel.: 519/254-5129

Sarnia District Office,
242 A Indian Road South,
Suite 209 S,
Sarnia, N7T 3W4
Tel.: 519/336-4030

Owen Sound District Office,
1180 20th Street,
Owen Sound, N4K 6H6
Tel.: 519/371-2901

Chatham Sub-District Office,
435 Grand Ave. West,
Chatham, N7L 3Z4
Tel.: 519/352-5107



West Central Region

Hamilton Regional Office,
Ont. Govt. Building,
113 King St. West,
Box 2112,
Hamilton, L8N 3Z9
Tel.: 416/521-7640

Cambridge District Office,
400 Clyde Road,
P.O. Box 219,
Cambridge, N1R 5W6
Tel.: 519/623-2080

Welland District Office,
637-641 Niagara St. N.,
Welland, L3C 1L9
Tel.: 416/735-0431

Simcoe Sub Office,
654 Norfolk St. N.,
Simcoe, N3Y 3R2
Tel.: 519/426-1940

Southeastern Region

Kingston Regional Office,
133 Dalton St.,
P.O. Box 820,
Kingston, K7L 4X6
Tel.: 613/549-4000

Ottawa District Office,
2378 Holly Lane,
Ottawa, K1V 7P1
Tel.: 613/521-3450

Cornwall District Office,
4 Montreal Road,
2nd Floor,
Cornwall, K6H 1B1
Tel.: 613/933-7402

Belleveille District Office,
15 Victoria Ave.,
Belleveille, K8N 1Z5
Tel.: 613/962-9208

Pembroke Sub-Office,
1000 MacKay St.,
Pembroke, K8A 6X1
Tel.: 613/732-3643







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